

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

E

Extension Tier Paper 2E

Thursday 30 May 2024

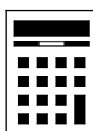
07:00 GMT

Time allowed: 2 hours

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.
- If your calculator does not have a π button, take the value of π to be 3.142

Advice

Show all necessary working; otherwise marks for method may be lost.

For Examiner's Use	
Pages	Mark
2-3	
4-5	
6-7	
8-9	
10-11	
12-13	
14-15	
16-17	
18-19	
20-21	
22-23	
24-25	
26-27	
28-29	
30	
TOTAL	



Answer **all** questions in the spaces provided.

1 These types of data are qualitative, discrete or continuous.

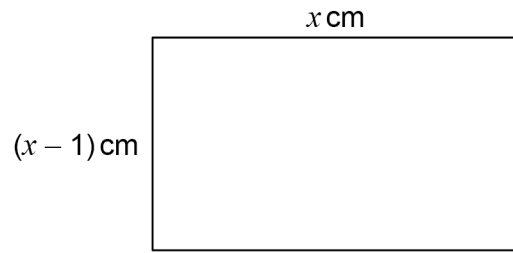
Tick **one** box for each type of data.

[4 marks]

	Qualitative	Discrete	Continuous
Number of students in a class	☐	☐	☐
Height of a person	☐	☐	☐
Favourite colour	☐	☐	☐
Time taken to run a race	☐	☐	☐



2 Here is a rectangle.



Not drawn
accurately

2 (a) The area of the rectangle is 6 cm^2

Show that $x^2 - x - 6 = 0$

[1 mark]

2 (b) Work out the value of x .

[2 marks]

$x =$ _____



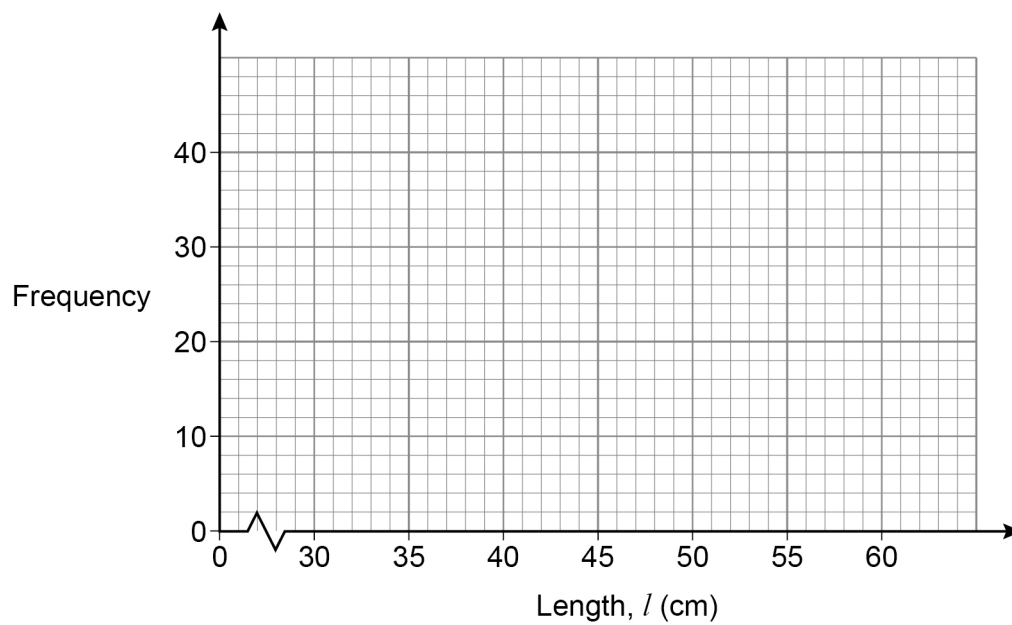
3

The table shows information about the length of babies.

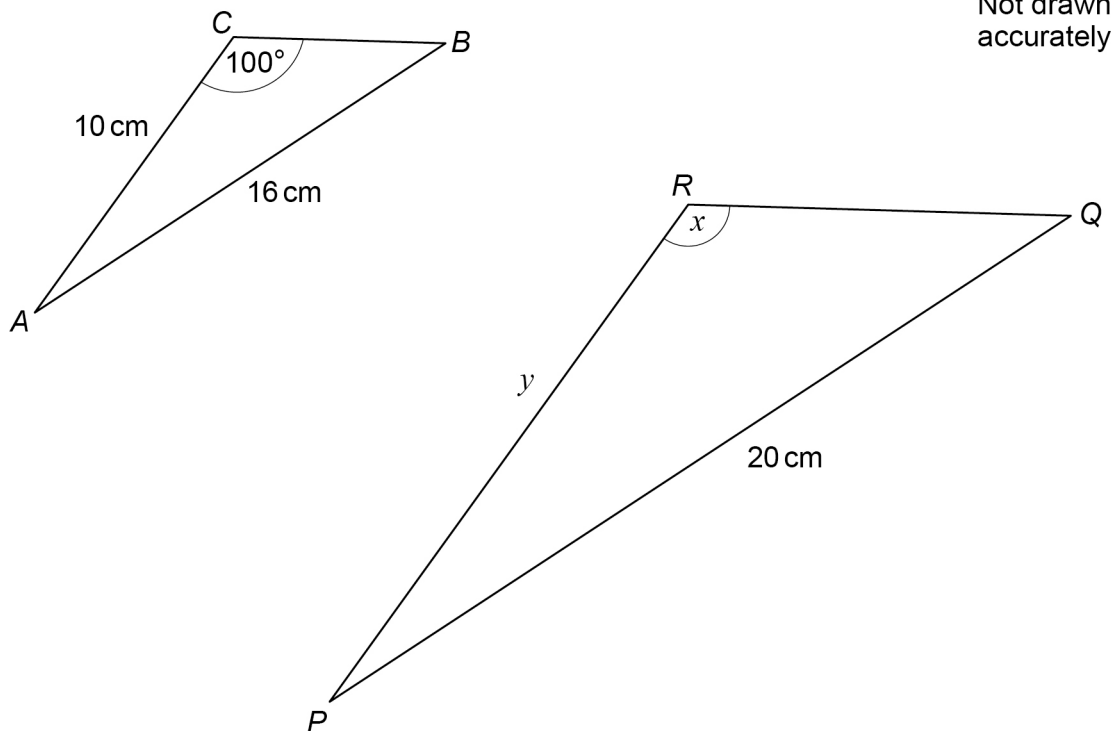
Length, l (cm)	Frequency
$35 \leq l < 40$	12
$40 \leq l < 45$	26
$45 \leq l < 50$	34
$50 \leq l < 55$	16

Draw a frequency polygon to represent the information.

[2 marks]



4

Triangles ABC and PQR are similar.4 (a) Write down the size of angle x .

[1 mark]

 $x = \underline{\hspace{2cm}}^\circ$ 4 (b) Work out the value of y .

[2 marks]

 $y = \underline{\hspace{2cm}} \text{ cm}$ 

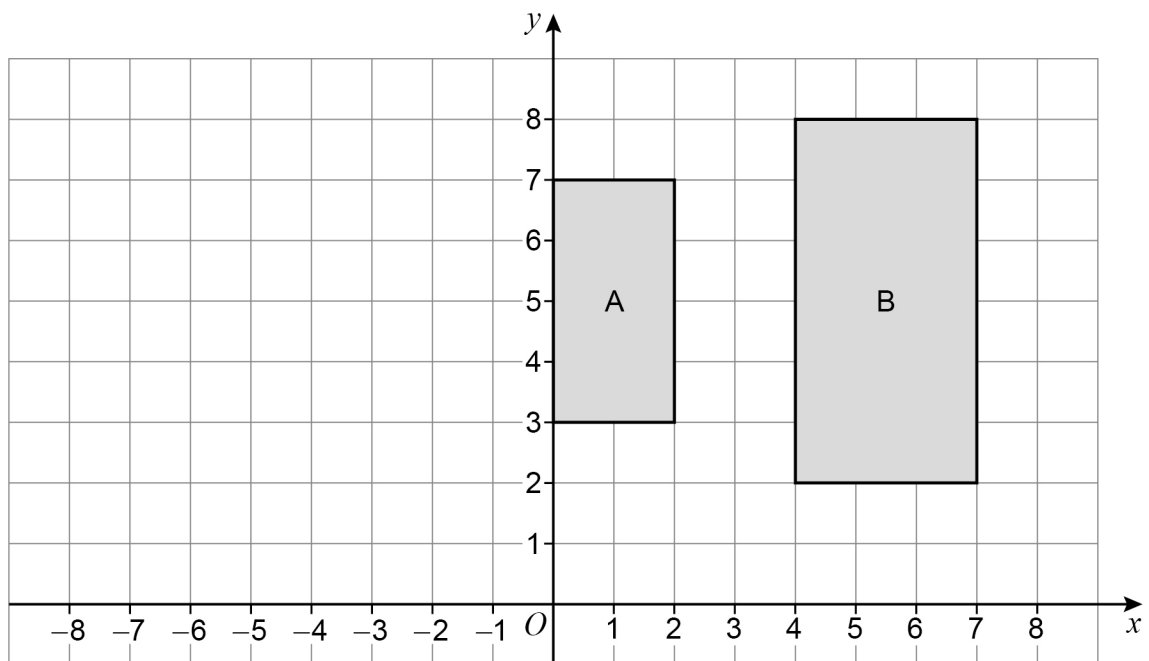
- 5 (a)** Point $(12, -6)$ is translated to point $(3, 1)$

Work out the translation vector.

[2 marks]

Answer $\left(\begin{array}{c} \\ \end{array} \right)$

- 5 (b)** Rectangles A and B are shown on the grid.



Complete the following statement.

[2 marks]

B is an enlargement of A with scale factor _____ and centre (_____ , _____)



6 (a) Simplify fully $a^6 \times a^3 \times a$

[2 marks]

Answer _____

6 (b) Simplify fully $\frac{(x^6)^3}{x^2}$

[2 marks]

Answer _____

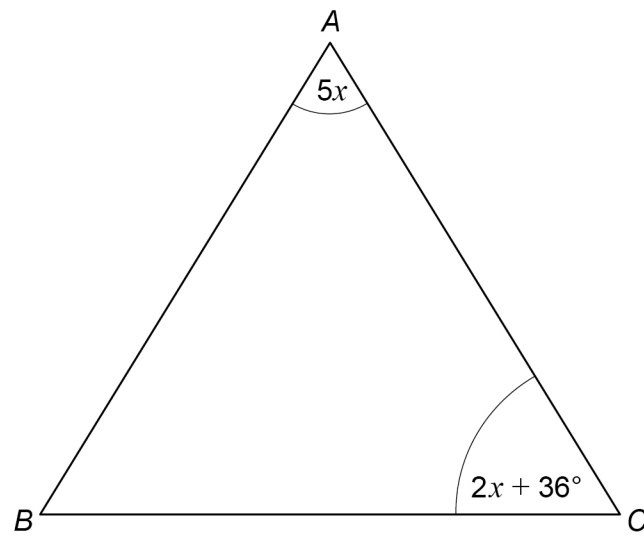
7 A pyramid has 5 vertices.
How many edges does the pyramid have?

[1 mark]

Answer _____



8

Here is triangle ABC .Not drawn
accuratelyAngle $BAC = \text{angle } ACB$

Is this triangle equilateral?

Tick a box.

Yes

☐

No

☐

Show working to support your answer.

[3 marks]



9 Show that $2\frac{3}{4} + 1\frac{5}{12} = 4\frac{1}{6}$

You must **not** use decimals.

[3 marks]

Turn over for the next question

Turn over ►



10

A regular polygon has n sides.

Each interior angle is 165°

Not drawn
accurately



Work out n .

[2 marks]

$n =$ _____



11 (a) Solve $\frac{5x+2}{3} = \frac{7-2x}{4}$

[4 marks]

$$x = \underline{\hspace{10cm}}$$

11 (b) Simplify fully $\frac{10x^2}{15x^2-10x}$

[2 marks]

$$\text{Answer } \underline{\hspace{10cm}}$$



12

Lee and Mia share \$208 in the ratio 4 : 9

Mia spends some of her money.

Lee now has \$30 **more** than Mia.How much money does **Mia** spend?**[4 marks]**

Answer \$ _____



- 13** ξ = set of **even** numbers between 21 and 39
A = set of multiples of 6
B = set of multiples of 4

- 13 (a)** Work out the value of $n(\xi)$

[1 mark]

Answer _____

- 13 (b)** Work out the elements of the set $A \cap B$

[2 marks]

Answer _____

Turn over for the next question

Turn over ►



14

$$7x^2 + 5x(2x + 6) - 2(x^2 + 4x) \equiv ax^2 + bx$$

Work out the values of a and b .

[3 marks]

 $a = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$ 

- 15 (a)** Write 8×10^{11} as a product of prime factors.
Give your answer in index form.

[2 marks]

Answer _____

- 15 (b)** Written as the product of prime factors,

$$x = 3 \times p \times q^2$$

and

$$y = p^2 \times q$$

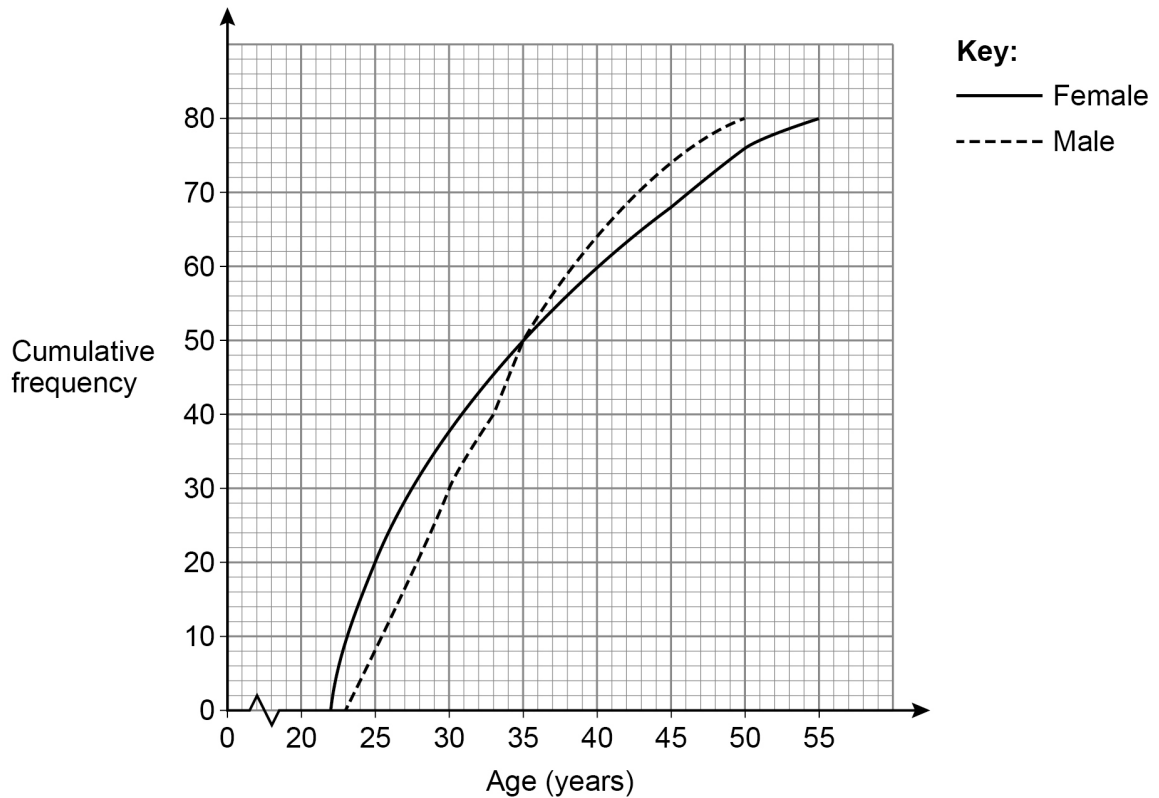
The highest common factor (HCF) of x and y is 91

Work out **one** possible pair of values of x and y .

[2 marks]

 $x = \underline{\hspace{2cm}} \quad y = \underline{\hspace{2cm}}$


- 16** The cumulative frequency graphs show information about the ages of 80 female teachers and 80 male teachers.



- 16 (a)** On average, which teachers are older?
 Tick a box.

☐

Female

☐

Male

Use one statistical measure to justify your answer.

[2 marks]



- 16 (b)** Use the graph to estimate the number of female teachers aged 50 years or older.

[2 marks]

Answer _____

- 17 (a)** w is 1600 to 2 significant figures.

Write down the **lower** bound of w .

[1 mark]

Answer _____

- 17 (b)** x is 32 to the nearest whole number.

y is 19.7 to 1 decimal place.

Work out the **upper** bound of $x - y$

You **must** show your working.

[3 marks]

Answer _____



18

The value of a house has increased by 2.5% per year for the last 4 years.

The value of the house is now \$300 000

Work out the value of the house 4 years ago.

Give your answer to the nearest \$100

[3 marks]

Answer \$ _____



[1 mark]

$$0.05\overset{\bullet}{5}\overset{\bullet}{4}$$

[3 marks]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Answer _____

Turn over ►



20 (a) Here are the first four terms of a linear sequence.

4 14 24 34

The sequence of positive square numbers is subtracted from the linear sequence.

Work out the n th term of the quadratic sequence that is made.

[3 marks]

Answer _____



20 (b) The n th term of a different sequence is $18n^2 + 60n + 50$

Prove that every term is double a square number.

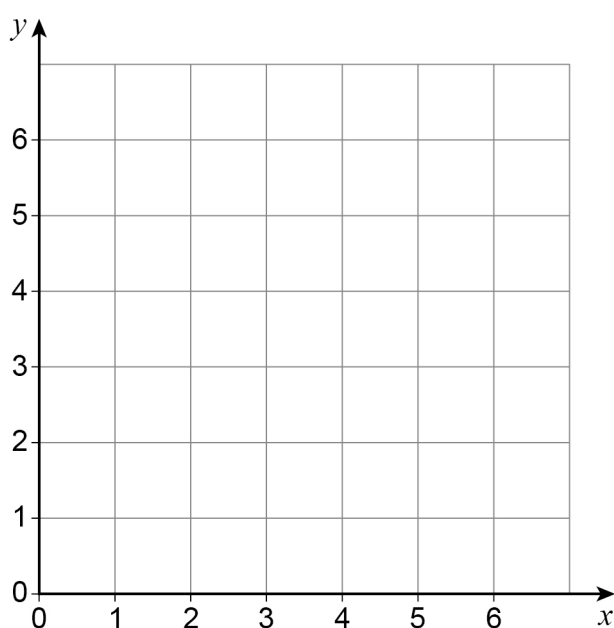
[2 marks]

21 On the grid, identify the region represented by

$$x \leq 4 \quad \text{and} \quad y \geq 1 \quad \text{and} \quad y < x$$

Label the region R.

[3 marks]

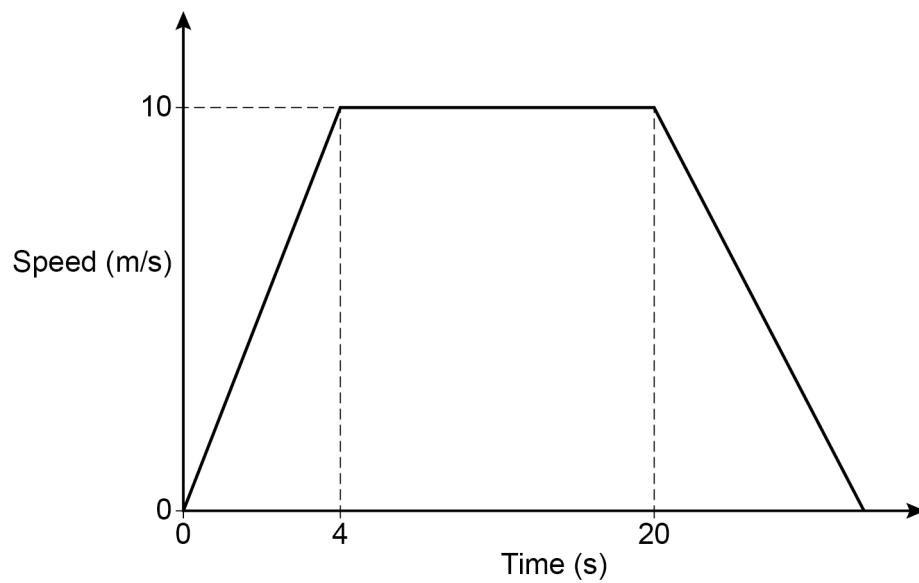


Turn over ►



22

Here is a sketch of a speed-time graph.

**22 (a)** Work out the acceleration during the first 4 seconds.**[1 mark]**

Answer _____ m/s^2 **22 (b)** The total distance travelled is 215 metres.

Work out the total time taken.

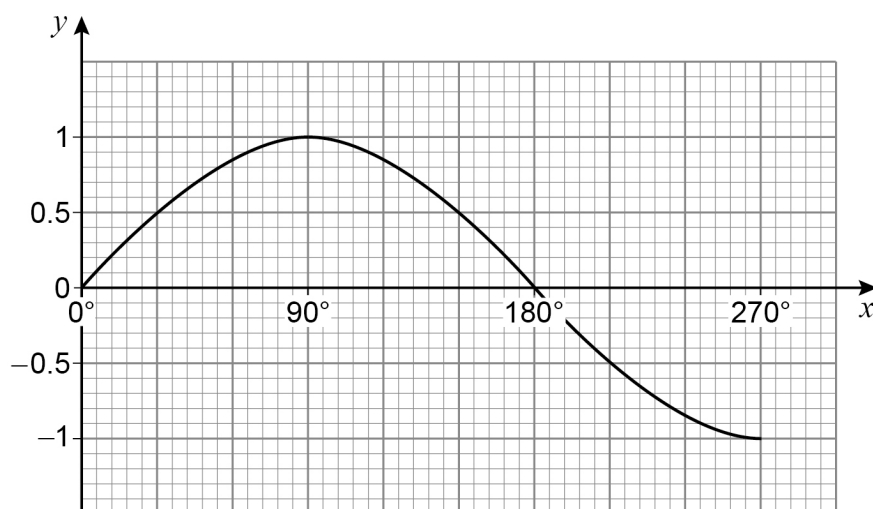
[3 marks]

Answer _____ s



23

Here is the graph of $y = \sin x$ for values of x from 0° to 270°



Solve $\sin x = -0.5$ for values of x from 180° to 360°

[2 marks]

Answer _____

Turn over for the next question

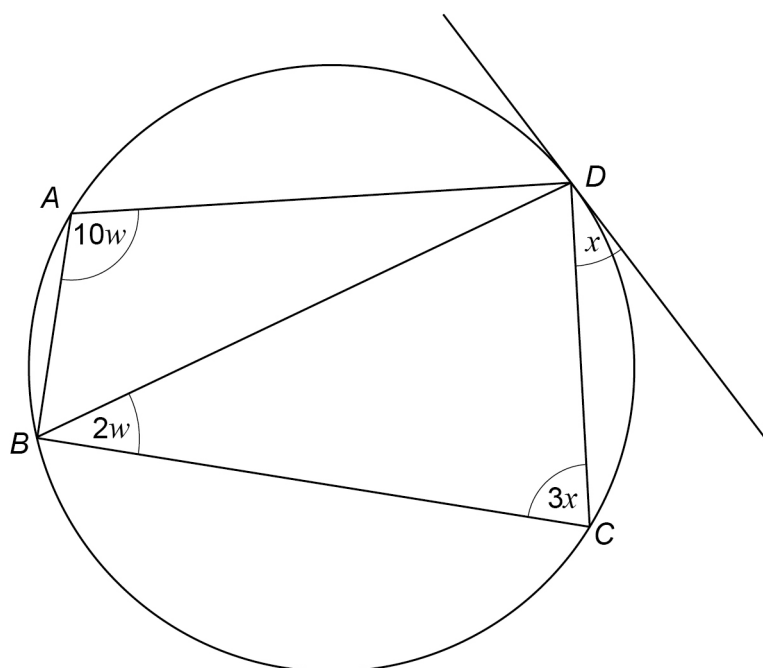
Turn over ►



24

A , B , C and D are points on a circle.

The tangent at D is shown.



Not drawn
accurately

24 (a) Give a reason why $10w + 3x = 180^\circ$

[1 mark]

24 (b) Give a reason why $x = 2w$

[1 mark]



24 (c) Work out the values of w and x .

[3 marks]

$w =$ _____ °

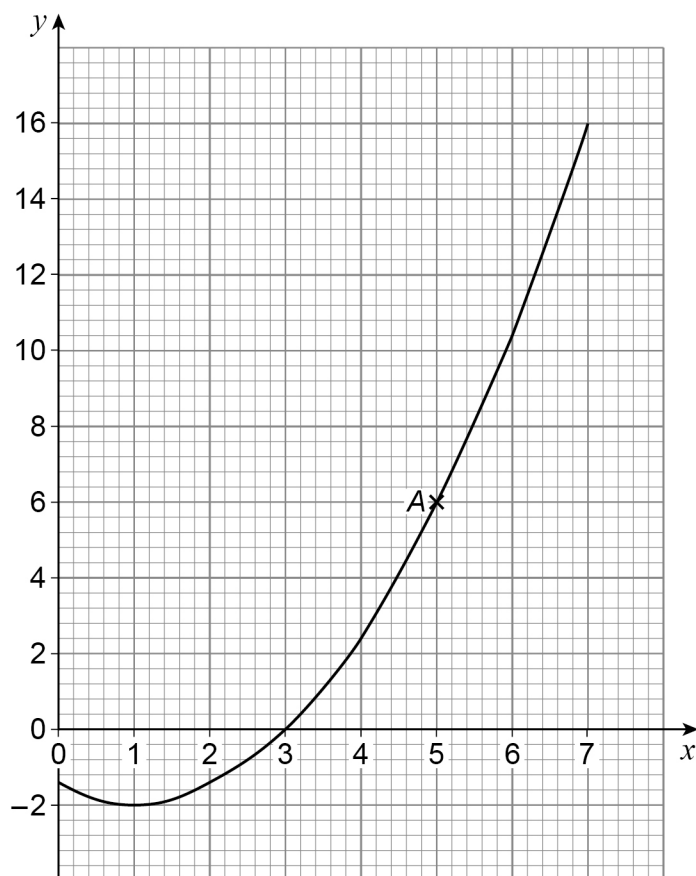
$x =$ _____ °

Turn over for the next question



25

Here is the graph of a curve.

The point $A(5, 6)$ lies on the curve.

25 (a) Draw a line through A that has the same gradient as the curve at A .

[1 mark]

25 (b) B is the point on the curve where the gradient is 0

Write down the coordinates of B .

[1 mark]

Answer (_____ , _____)



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outside the
box*

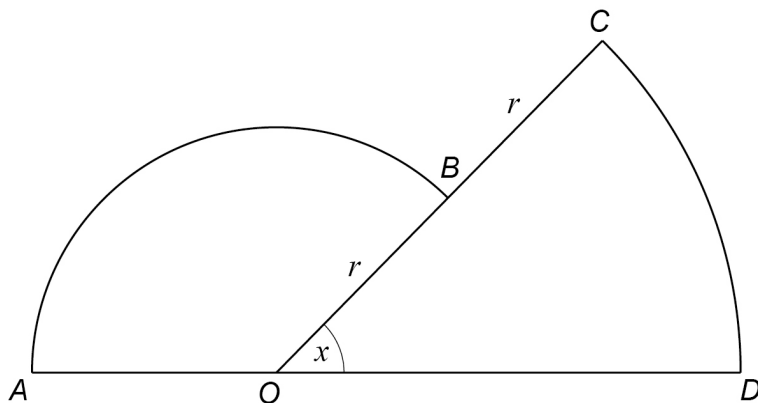
26

A shape is made from sectors of two circles, both with centre O .

AOD is a straight line.

$$OB = BC = r$$

Not drawn accurately



The areas of the two sectors are equal.

Work out the size of angle x .

[4 marks]

[illegible]

$x =$

F

Turn over ►



27

10 tins each contain coffee or tea.

6 tins contain coffee and 4 tins contain tea.

Two tins are chosen at random **without** replacement.

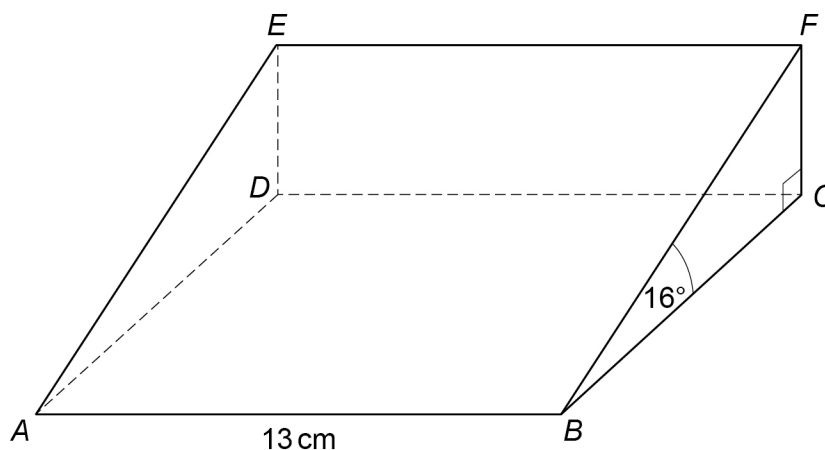
Work out the probability that one tin contains coffee and one tin contains tea.

[4 marks]

Answer _____



28

 $ABCDEF$ is a triangular prism. $ABCD$ is a square. $AB = 13\text{ cm}$ Angle $BCF = 90^\circ$ Angle $FBC = 16^\circ$ Work out the size of the angle between AF and $ABCD$.**[4 marks]**

Answer _____[°]

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ANSWER IN THE SPACES PROVIDED**



[illegible]

[illegible]

[illegible]

[illegible]

There are no questions printed on this page

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outside the
box*

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ANSWER IN THE SPACES PROVIDED**

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